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PRESCRIBED FIRE MANAGEMENT AND CULTURAL RESOUCE MANAGEMENT

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Prepared for:

Prescribed Fire Management Training Course
National Interagency Fire Training Center
Marana, Arizona
May 4-5, 1982

USDA Forest Service
Southwestern Region
Coconino National Forest
2323 E. Greenlaw Lane
Flagstaff, Arizona 86004

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Cultural resource management is a fairly new area to both land managing agencies as well as archaeologists, anthropologists, and historians. As a newly evolving discipline, there are few hard and fast rules and we are continually determining new approaches to integrate cultural resources into multiple-use management.

One of our first questions is to determine just what exactly is a cultural resource. Most people immediately think of old bones and pot sherds, but cultural resources are more than that. Actually, there are several classes of cultural resources. Prehistoric sites are places evidencing use or occupation by early peoples. These include artifact scatters that may indicate locations where tools were made, depressions representing a pit house village, a mound of rocks that is a pueblo ruin, or a rock art panel where figures were carved into the rock centuries ago. All have their story to tell in reconstructing early man's past use and history of an area.

Historic sites pertain primarily to our own presence, rather than that of prehistoric Indians. Old cabins, trails, battlegrounds, smelters, logging camps, and ghost towns are the physical monuments evidencing our culture's settlement, exploitation, and development of the American continent. The reason historic sites are important is that most historic records deal with the great men and great places of the day. The day-to-day life of the average citizen is seldom documented. In addition, the work of historic archaeologists has often augmented an area of history that was only sketchily documented, or in other cases, has demonstrated that the recorded events of the time did not really tell the whole story, or even the true story.

Places that commemorate some important event are other kinds of cultural resources, even if no ruin or artifacts are present. Places like Plymouth Rock, a meadow where a treaty was signed, or the apple tree where Newton conceived of the law of gravity are examples that come readily to mind.

Places used and revered by American Indian, the first Americans, are a class of cultural resources for which agencies are only recently beginning to develop management strategies. These might include traditional areas where soil or plants are collected or animals hunted for secular or religious activities. Sacred places to many tribes might have a constructed shrine present to identify them, but many more might simply be a rock, mountain, tree, or place that could not be recognized by the uninitiated. Because the cultural values of such places are difficult for non-Indian people to understand, they constitute particularly challenging management situations.

In some cases, prehistoric resources might also be an important or sacred place. Some examples might be a ruin their ancestors came from or rock art sites used in the training of medicine men or that commemorate a particularly important event in the mythological history of their people.

Regardless of the form or nature of a cultural resource, they all have one thing in common--they are unique resources that are nonrenewable. Unlike threatened and endangered animals and plants, you can't grow another prehistoric site. The ones that presently exist are all that will ever exist and the role of management is to ensure the wisest use of these one-of-a-kind resources into perpetuity. Although we are still constructing buildings and depositing artifacts like beer cans that will become the archaeological sites

of the future, they represent our culture, today, not that of our direct pioneer ancestors or the prehistoric Indians who preceeded them. The behavioral patterns of people of the past, their history, and their successes and failures in adapting to their environment can only be known if the sites representing their culture are left intact for proper study in the future.

In the case of cultural resources cherished by Native Americans, there are other reasons for protecting them above and beyond the opportunity to learn about past cultures. To the Native American, traditional areas and religious places still play an important role in giving meaning to their lives and a sense of perspective in their place in the universe. Native American values in this regard are often quite beyond the understanding of other Americans. Seemingly inconsequential acts to us may have tremendous consequences to Indian cultures and their traditional belief systems. For example, converting a sacred spring to a domestic water source, erecting a radio tower atop a sacred mountain, or restricting access to an area by a fire closure might have effects ranging from the extinction of a particular cremony because the proper materials can no longer be obtained, to the disruption of the entire culture because of desecration to a particularly sacred place.

One of the hallmarks of American society is its pluralistic basis--that many different peoples and cultures have all contributed a share towards making our country the way it is today. Preserving and enhancing these traditions, whether they be Indian, Chinese, Black, Amish, or Appalacian hill-folk, is a way to give Americans a proper balance and perspective of their culture and heritage. Many of the rich cultures that have contributed to our society have either become extinct or are "threatened and endangered" and consequently need special management consideration to ensure their vitality and preservation. We also much to learn from these cultures. For instance, take the topic of this training program, prescribed fire management.

The Native American long ago recognized the potential of prescribed burning a management tool. But only recently have aboriginal fire practices and their resultant beneficial effects been recognized. There is evidence to suggest that nearly all of the tribes in the western United States and most of those on the plains used burning to manipulate and control their environments. Through the use of frequent, low intensity surface fires, Native Americans formed ecological niches to suit their own cultural needs and life styles. Nomadic groups tended to burn haphazardly, while sedentary agriculturalists more often burned methodically. In addition, aboriginal controlled burning helped maintain thinned, more vigorous timber stands, prevented fuels build-up, helped perpetuate shade intolerant plant species, recycle soil nutrients, prepare conifer seed beds, and stimulated growth of wildlife browse--all desirable management practices we have come to realize today.

Thus, while consciously manipulating the environment in order to continue traditional subsistence patterns, the Native Americans knowingly improved the natural ecological balance, and recent studies indicate that the modern forester may be able to improve land management practices and planning by studying aboriginal burning.

Many uses for controlled burning have been documented for various Indian groups: food plant production, improvement of livestock and wildlife forage, communication, game drives, promoting ease of travel, cleaning camp sites,

clearing land for farming, ritual activity, and to reduce hazards such as surprise attack or snake habitat by removing brush. Many of these uses were very important to the subsistence base, life style, and territorial habitation of an Indian group, and were quickly adopted by the early Anglo pioneers in the formative centuries of the nation. Daniel Boone, for example, used controlled burning to help clear the trails he pioneered.

However, when Anglos instituted fire suppression during the early 1900's, not only was wild fire conflagration invited, but Indian cultures were disrupted too. Even today, this has resulted in some major impacts to Indian groups, such as the Yurok of northern California. To the Yurok, baskets were necessary for certain ceremonial rites and the sale of baskets was a way to augment meager cash incomes. In addition, the rank and status of certain individuals and families was indicated by distinctive designs on basketry hats. In order to weave such baskets, it is necessary to burn off certain plants to product new shoots with the proper strength and resiliency for weaving. Because of potential fire danger and not appreciating the importance of basketry in their culture, the Forest Sevice physically prohibited the Indians from burning these areas. The result has been the almost total extinction of Yurok basketry and disruption of certain social and ceremonial aspects of their culture. Fortunately, however, this situation has changed, and the Forest Service is now working with several California tribes and conducting prescribed burns to promote various cultural practices.

The results of Native American controlled burning are impressive, for not only were tribal economics boosted, but there is also some evidence to indicate the ponderosa pine/douglas fir forests in Montana evolved as a result of frequent fire disturbances. It also appears that the California coastland pine-oak and inland oak-chestnut communities were maintained by burning. Studies also show that controlled use of fire may have played a significant role in the emergence of plant and animal domestication in Iran, on the one hand, and total independence of agriculture among California tribes on the other.

WHAT IS THE RELEVANCE OF ARCHAEOLOGY TO MODERN SOCIETY?

But what of relevance are archaeological sites and artifacts to us today? First and foremost, archaeology is one of the branches of anthropology--the study of man--which is dedicated to the preservation and understanding of human behavior. As with any other scientific endeavor, part of this is the preservation of knowledge for the sake of knowledge, since we never know when this information might be useful to us today. Also, by knowing where we were in the past, we are better able to understand why we are like we are today, and thereby can better predict how we are likely to behave in the future.

Archaeology also offers many talents that are directly useful to modern society. For example, in developing and using tree-ring dating, archaeology has provided information that has been useful in developing models and predictions for long-range weather forecasting. Our ability to date archaeological deposits and the animal bones and seed remains in them provides a basis for biologists to examine and predict rates of genetic change. Archaeology provides a laboratory with time depth to it in which various theories and predictions of human behavior can be tested. From archaeological studies, we have learned that many of the problems facing us today were also

experienced in the past. By learning the successes and failures of man's past responses to these situations, we can hopefully learn to avoid some of them in the future.

For example, over-population and over-crowding are serious problems in large cities and many nations of the world. By observing such phenonmena archaeologically, we can hopefully learn to recognize critical signs during the development of a population that will head off some of the negative results of over-population, such as large scale rioting and malnutrition.

As modern American civilization expands, we are becoming more and more aware of the limited nature of certain natural resources such as land and timber. This, too, was a problem faced in prehistoric times. In Chaco Canyon, New Mexico, for example, a sophisticated and thriving culture existed until the 12th century, when it inexplicably fell apart. Increasing evidence suggests denudation of surrounding forest lands contributed to their extinction. In the Flagstaff area, over-use of farmland is thought to be another factor in the disruption of prehistoric population centers.

On the more positive side, in the Gila and Salt River valleys, where the modern cities of Tucson and Phoenix are located, the Hohokam culture existed in a hostile environment for almost 2,000 years and became one of the most important prehistoric cultures in the Southwest. These examples all illustrate situations faced by the world today. Can we learn from the lessons of the past or are we doomed to continually repeat their failures?

More down-to-earth examples of some benefits archaeological knowledge can make to modern man concerns agricultural production in marginal environments. The Negev Desert, in Israel, is one of the most barren places in the world, yet the ruins of towns and extensive prehistoric field systems indicate it once was home to a thriving civilization. For years, Israeli scientists tried many different ways to use modern technology to reclaim this desert, yet continually failed. Finally, an Israeli archaeologist who had studied these prehistoric field systems convinced the government to let him try an experiment in reclamation, based upon the prehistoric technology he had studied. The result was that he succeeded, using prehistoric technology, where modern technology had failed and portions of the Negev are once again producing farm produce for a hungry nation.

Here in Arizona, a similar experiment is being conducted on the Coconino National Forest by the Arizona State Museum. Due to years of overgrazing and climate change, portions of the Verde Valley have suffered considerable erosion. Like the Negrev, the Verde Valley also had hundreds of prehistoric field sites that indicate its prehistoric inhabitants had a detailed knowledge and ability to manipulate soil and water run-off for agricultural purposes. After studying these features for several years, archaeologists have constructed a similar field system to determine its feasibility to control surface erosion and facilitate small-scale agriculture. This system has been functioning for almost three years and is successfully stopping erosion, encouraging soil build-up, and promoting the growth of plants to further stabilize the area. In addition, other experiments have shown that the water needs of crops grown in such features is markedly less than that of traditional garden practices. The utility of this low-cost, energy efficient technology is being demonstrated and has attracted the interest of U. S. Department of

Agriculture scientists who are conducting similar experiments in arid lands agriculture and reclamation.

Lastly, for whatever reason it is evident that the American public is highly interested in archaeology and supports archaeological researches. Attendance figures at archaeologically-related parks and monuments has increased dramatically in the last thirty years and has increased at a high rate than that of other parks and monuments. In 1978, for example, almost two million people visited archaeological parks and monuments in Arizona. There is no way of estimating the total number of people who have visited undeveloped sites on public lands throughout the country, but observations at a cliff dwelling on the Coconino National Forest suggest over 5,000 people a year visit this site alone.

EFFECTS OF CONTROLLED BURNING ON CULTURAL RESOURCES

It is difficult to assess the impacts of fire on cultural resources because only a few formal studies of the effects of fires on archaeological sites have been made--the Radio and Jacket Fires near Flagstaff, Arizona; the La Mesa Fire near Bandelier National Monument, New Mexico; the Moccasin Mesa Fire at Mesa Verde National Park, Colorado; and at Pinnacles National Monument in Northern California - and these were all wild fires, not prescribed burns.

More study is needed to determine the full range of effects to cultural resources by controlled burning projects. In order to accomplish this, a variety of experiments in different areas with different kinds of cultural resources needs to be done. Only by observing fire effects in a variety of conditions can we know for certain that there is no significant or irreplaceable loss to cultural resources as a result of controlled burn programs.

Experiments of this sort would be an ideal opportunity for interagency cooperation and could assess the relative success of the fire management procedures and philosophies of different agencies. The value of such cooperation has already been demonstrated by studies of the Radio Fire and the La Mesa Fire, conducted by the Coconino National Forest and the Southwestern Regional Office of the National Park Service. These two studies are the main data sources available for assessing the impacts of fire and fire management activities on cultural resources. They found that the effects to cultural resources by fire depends to a great degree upon how a project is conducted and the nature of cultural resources in the project area.

Negative Impacts

Obviously, sites that contain wood or that are made of wood, such as many historic period structures, can be completely destroyed by fire. Impacts to prehistoric sites, consisting of broken artifacts below-ground pit houses, or tumbled rock pueblo walls, are usually less severe. Fire will burn pot sherds, change their colors, and alter the paints and glazes they are decorated with, making identification difficult in some cases. Such changes begin to occur with temperatures of 500° C. (925° F.). With temperatures above300° C. (590° F.), stone artifacts will spall, crack, or break from intense heat.

Materials used for several dating techniques may also be affected by fires. Samples used for Carbon-14 dating can become contaminated from ash and charcoal produced by fire, and could yield a date more recent than the true date of the sample. Obsidian hydration is a dating technique that measures the amount of moisture present in the external surface of an obsidian artifact. Heat from a fire can alter the moisture content, thus yielding an earlier date than is in fact the case. Another dating technique, archaeo-magnetic dating, measures the orientation of electrons in samples from prehistoric hearths. If these features are subjected to temperatures above 525^0 C. (1000^0 F.), they too can give erroneous information.

During controlled burning, these effects are usually not severe, since most artifacts are insulated from the heat of a burn by the earth covering the site and ideal temperatures for most controlled burns are less than those that critically effect artifacts. Should a fire get out of control, or if it is intended to burn at a high temperature, artifact and site damage can result.

Rock art sites, particularly those were designs are painted, rather than pecked, onto stone, are especially susceptible to damage by fire. Designs can be scorched or completely burned away while petroglyphs on friable stone, such as sandstone or limestone can spall off at certain temperatures.

Studies of the La Mesa and Radio Fires found that heavy equipment and during suppression activities and mop-up operations had a greater effect to archaeological sites than did the actual fire itself. Artifacts are broken and displaced and small sites can be completely destroyed by one pass of a bulldozer blade. Depending on the depth of a blade cut and the proximity of site features to the surface of the ground, buried features, such as walls, burials, and firepits, can also be destroyed by bulldozer work. During both the Radio and La Mesa Forest Fires about 15 percent of the archaeological sites in the area were damaged by heavy equipment. In the La Mesa Fire, however, most sites were damaged during mop-up and restoration activities. Both instances point out the importance of timely planning and continued coordination with archaeologists for projects involving the use of heavy equipment.

Training of personnel involved in project work is also a key towards minimizing project impacts. During the Radio Fire, Forest Service personnel walked in front of the bulldozers to direct their activities. In a number of instances, these people directed the bulldozers around the more obvious sites to protect them from damage.

Positive Effects

Not all activities associated with controlled burning are necessarily adverse. Several positive effects can also result. Certain areas of the western United States are thickly covered with brush or chapparal so that the surface of the ground cannot be seen. Removal of this cover by burning can make sites visible, or more easily detected. In Mesa Verde National Park, for example, many sites such as prehistoric farming terraces, were revealed when fires when fires burned away the dense underbrush. Before this, archaeologists were not aware of the abundant existence of such features in the Mesa Verde area.

Fire can be used to preserve the natural historic environment of an area. Archaeological work at Ft. Larned determined it was situated in a grassland when it was occupied in the 1800's. Controlled burning removed the recent pinyon-juniper invasion of the area to restore the original grassland setting of the region. Similarly, controlled burning can be used to remove dog hair thickets from historic trails, such as the General Crook Military Road on the Coconino National Forest, thus opening it for recreational use by the public.

In the case of Native American needs, burning can be used to promote the growth of certain plants used for food, medicine or craft manufacture. In the Yurok basketry example mentioned earlier, such activity is helping revitalize certain areas of traditional Indian culture.

Lastly, one of the most important benefits to cultural resources that can be served by controlled burning is that it reduces the potential for wild fires and, consequently, the chances for damaging archaeological sites during fire suppression activities.

HOW IS A CULTURAL RESOURCE EVALUATION MADE, AND HOW IS THIS INFORMATION USED IN A PRESCRIBED BURNING PLAN?

As for any other project activity, carefully planning of a controlled burn project is the key to success to minimize adverse effects to cultural resources. One of the first sources of information that should be consulted when developing a prescribed burning plan is your archaeologist. Decisions as to whether or not archaeological input is needed for a project should not be made unilaterally by a project manager unless that manager has adequate archaeological training.

Archaeology is a very specialized field with extensive legal compliance procedures behind it that must be met, and most project managers and line officers do not have the training or detailed working knowledge needed to function in these areas. As with any project, get the right person for the job--one who can provide you with the specialized information you need to help you do your job. If your agency has an archaeologist, talk to that person to determine whether or not cultural resource input is necessary for your project. It only takes a few moments and it can save you many problems in the future.

The archaeologist can provide you with information about the number and nature of cultural resources, known or predicted to occur, in a proposed project area. Are there abundant cultural resources in your proposed project area? Are there historic settlers cabins or saw mills present that could be destroyed by fire? Has the area ever been examined by an archaeologist? This information can be evaluated against the kinds of impacts that can be expected to occur from the prescribed burn and thus provide useful planning information.

Most of the time, your archaeologist can also tell you if there are any Native American concerns that might be effected by a prescribed burn. Is your proposed project in an area that is considered highly religious? Would burning at a particular time of the year disrupt traditional religious pilgrimages, plant collecting, or hunting practices in the area? If your archaeologist doesn't know these things, trips to tribal reservations may be necessary to

consult with traditional religious leaders. Perhaps Indian employees in your own agency may be able to tell you about such concerns.

It is also important to consult people living in or near the area that will be effected by the burn, not only to notify them that they will be seeing a controlled burn, rather than a forest fire, but to determine any concerns they may have, such as strong objections to the smoke and congestion that will result from the burn. If there are concerns, or even hostilities about a proposed burning program, extra public information and involvement efforts may be necessary to keep the good will and confidence of local communities.

A good example of this is on the Coconino National Forest and involves Forest burning activities visible from the town of Sedona and Oak Creek Canyon, an area noted for its great scenic beauty as well as a high number of elderly and politically influential inhabitants. Occasionally, smoke from prescribed burns will flow into Oak Creek Canyon, clogging the canyon as well as the lungs of the townspeople. This has resulted in considerable public outcry and ill feelings towards the Forest at times.

To reduce these negative reactions, the Forest emphasizes a public information program to inform the public about prescribed burning and its utility as a Forest management tool. As part of this process, the public is notified ahead of time as to when burning is scheduled so that people with respiratory problems can make appropriate plans. Newspaper, television, and radio information announcements are made to further explain prescribed burning and bus tours for residents are scheduled to inform and involve them in the planning of the prescribed burn program. The result is a public that is better informed about Forest management practices, and a significant decrease in negative public reaction towards the fire management program. Although it may take some time and effort to consult Indian groups and concerned local publics, such time spent early in the planning process may save considerable time later by avoiding bad feelings, law suits, and embarassing meetings or press coverage.

If adequate information is not presently available in the cultural resource inventory records of your agency, it may be necessary for the archaeologist to perform some field reconnaissance of the project area to determine the nature of cultural resources present. For the first step, some sample of the project area should be performed. Sampling is an efficient way to obtain basic information about an area. Many times, the control lines planned for the project can be examined by the archaeologist as part of the sample. In this manner, not only can the cultural resources of any area be predicted, but the potentially most damaging activity of a prescribed burn, the fire control lines, can be examined and changed, if necessary, to avoid impacts to a cultural resource site.

The intensity of sample coverage, either as a percentage of the total project area or the number of sample units inspected, is a topic of considerable debate among cultural resource specialists. It is highly dependent upon the nature of the country, the sites, and the status of archaeological knowledge of the area. As a rule, sampling will give you a higher estimate than the actual number of sites in an area, but will not always locate rare or unusual sites, which may be the most significant sites in a project area. Similarly, if proximity to roads or trails is the most important determinant for the location

of historic period sites, sample strategies based upon natural vegetation zones might not locate historic sites, or may give a prediction weighed too heavily towards prehistoric sites.

The results of the sample survey determine whether or not any additional work is needed. For example, if no sites were found during the sample, the sample covered most of the proposed fire control lines, and archaeological knowledge from similar areas suggests the potential for sites in the area is low, no further work is needed. If, however, the sample found numerous log cabins, fragile pictographs on crumbly rocks, and several Indian shrines with offerings on them, the manager may have second thoughts about his original plans to burn the area.

Once the location, probable locations, and nature of prehistoric and historic resources in an area are known, prescriptions need to protect these resources during project activities can be made. Possible prescriptions might be to put a fire line around sites with wooden structures so they are not burned, modify project boundaries to avoid rock outcrops where rock art is located, remove combustible materials from the surface of a site so the fire will burn around it, shift the location of a control line to avoid a site, change the proposed dates of the burn so it does not impact Native American use of the area, or, simply have the archaeologist monitor the burn while it is progress.

CONTINGENCY PLANS

As the saying goes, "The best laid plans of mice and men often go astray" and it is wise to make contingency plans to ensure cultural resources are not impacted by emergency operations needed to contain a burn that gets out of hand. The nature of cultural resources in the area and the local conditions, once again, will determine the kind of back-up plans necessary. If consultations with Indian groups or local citizens is necessary, fire management officers should consider "what-if" situations, and present them to these groups to get advance planning information.

One possibility is to plan back-up fire control lines and have them inspected by the archaeologist before the burn begins. Good on-the-spot assistance can result if people performing the burn receive prior training in cultural resources and how to recognize cultural sites. Alternatively, the archaeologist can be advised ahead of time as to when the burn is planned so that special arrangements or stand-by status can be made if needed. The archaeologist can also provide project managers with a list of other archaeologists, amateur archaeologists, and para-archaeologists who would be available in case of an emergency.

Long-term planning is another way to prepare for the unexpected. The fire management officer and the archaeologist can work together to plan and define "let-burn" areas, where allowing a fire to burn, rather than to rush in with suppression equipment and crews, would be in the best interests of protecting cultural resources.

VISUAL IMPACTS AND PLANNING

As with the case of cultural resource specialists, visual resource management is another specialized area that is outside the expertise of most project managers. In the case of visual impacts and planning however, "beauty is in the eye of the beholder", and there can be serious disagreements about what is or is not visual impact. Such conflicts sometimes result because of the perceptual difference between the short-term, production orientation of the person doing a project and the long-term, future oriented perception of the planner or landscape architect. When conflicts arise, they need to be solved through discussion and compromise, rather than by a unilateral decision. If your agency has a visual resources specialist, give them the information they need about your project, and work with them so they can help you do a better job.

Any special management procedures to protect or enhance the visual resource, as with cultural resources, depends upon the burn objectives, burning techniques, and the burn location. In addition, the visibility of the project area, the number of people who routinely view that area, and the length of time the view will be affected by the burn are other factors that need to be considered for visual resource planning. It is important to determine the visual focus that will be effected by a project, and whether it is primarily oriented towards the foreground, the distant horizon, or both. For example, will the burn cover the side of a mountain that is visible for miles around, or is it located in a small valley that is hidden from view? Is it located in an area that few people frequent, or does a major hiking trail cross the proposed burn area? Will smoke from the burn stay hidden from view by the mountain, or will it drift down a canyon and into a town?

Once the focus of visual impact is defined, evaluations as to acceptable scorch height and severity can be addressed with the visual resource specialist. Is the project area one that is primarily viewed on the spot by hikers, so that scorch height should be as close to the ground as possible, or is it mostly viewed from a distance, or at an angle, so that higher scorch marks would not likely by seen by the usual viewer?

Controlled burning can be used to enhance the visual resource. For example, dog-hair thickets can be removed to open up the view. Broad views of landscapes with little or no variation can be made less monotonous by changing the vegetative cover or texture through prescribed burning. Burning can also alter the landscape so that the viewer's focus is directed towards other areas.

Through careful planning definition of objectives, the needs of the archaeologist, the visual resource specialist, and the fire management officer can all be met to further the goals of multiple resource management.

In sum, fire management must include cultural resource concerns along with other resources, when planning or implementing fire managements activities. Certain aspects of the cultural resource are unique, and require direct involvement of cultural resource specialists. But, with proper planning and integrated resource management, the needs of both fire management and cultural resources can not only be met, but can protect and enhance the goals of land management agencies.